FORMULA FINANCING:

THE CONCEPT AND ITS APPLICATION TO THE

NORTHWEST TERRITORIES

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Purpose of Paper

The current procedure for funding the Government of the Northwest Territories is similar to that for individual departments of the Federal Government in that it involves a detailed examination of the Territories' revenues and expenditures at the lowest level. A deficit grant equal to the forecast difference between operating and maintenance expenditures and revenues is determined in this manner.

The problem with this approach is that it is not consistent with the Northwest Territories' status as a government entity. As a result, in June 1974, an Interdepartmental Working Group was formed by the Interdepartmental Committee on Financial Relations with the Territorial Governments (IDC) to study the feasibility of using a so-called "formula financing" approach to determine the level of O&M expenditures to be taken into account when calculating the deficit grant.

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The purpose of this paper is to explain what "formula financing" means and entails in this context.

Concept of Formula Financing in the Present Context

The words "formula financing" no doubt imply a different meaning to different people. However, in the context of determining the O&M deficit grant to the Government of the Northwest Territories, the concept involves a technique for determining an appropriate level of expenditure to be compared with the forecast level of revenue. In this context, "formula financing" is not an expenditure budgeting technique. Indeed, it is part of a means of computing or determining a major item of revenue - an unconditional intergovernmental grant.

Adoption of a formula financing procedure by the NWT Government would be a significant step in the Constitutional evolution of the Territories. No longer would there be a line-by-line examination of the NWT's A Budget expenditures by the IDC; rather, the NWT would be able to plan these expenditures alone, given revenues from its own sources and the Federal deficit grant.

Acceptance of formula financing does not, however, eliminate the need for budgeting. The formula would simply yield a forecast level of the A Budget operation and maintenance expenditures for the New Year to be used in computing the deficit grant. Given the amount of the grant, the Northwest Territories' Government would then have to prepare its budget in the conventional manner. This involves allocating among its services the total funds to be made available under the grant and from its own sources.

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It cannot be emphasized too strongly that acceptance of a formula financing approach means that the NWT, IAND, and the Treasury Board must be prepared to accept the total which arises from application of the formula - a total which undoubtedly will differ from that which would result from the current approach. This means that the NWT must plan and budget its expenditures taking into account the predetermined grant, rather than determining the level of the grant through the addition of various expenditure items included in the budget. On the other hand, IAND and TBS must relinquish some of the control they presently exercise over the determination of the NWT budget.

Ways of Calculating Unconditional Intergovernmental Grants

One method of calculating the level of an unconditional intergovernmental grant is simply to set the total amount at some arbitrary figure or apply an arbitrary rate of growth to current year expenditure estimates. The latter is done, for example, in the Department of National Defence. Some flexibility might be instituted by basing the rate of growth on the change in a widely accepted general economic variable such as GNP. However, in either case, it is clear that such an arbitrary figure would not necessarily closely approximate the expected change in the Territorial Government's expenditures.

Another method, which is currently employed in Canada to determine revenue equalization grants to provincial governments, involves the use of an explicit objective formula to determine differentials in potential revenue yields as measured on a comparable basis. The grant is then based on these differentials. An effort to apply this formula to the NWT Government some years ago proved fruitless, essentially because the population range and economic structure of the Territories was too different from that of the provinces.

A third approach to calculating unconditional intergovernmental grants may be termed the "fiscal need" approach. Ideally, the theoretical or normative fiscal need of the recipient government should be computed and a grant made on this basis. However, for various reasons, both conceptual and technical, and particularly because of the normative decisions which are involved regarding the service levels to be provided, it has been impossible to put this concept into practice.

However, it is possible to consider fiscal need from a positive rather than a normative point of view. This would involve forecasting expenditures on the basis of recent actual levels of expenditures and expected changes in the fundamental determinants of expenditures.

Techniques of Forecasting Aggregate Expenditures

Formula financing in the present context, therefore, involves a highly aggregative forecasting technique. Forecasts may be derived from linear projections of time trends or from

multiple regression analyses.[1] Strict use of these methods requires historical data series, the longer the better, which have not been subjected to structural changes such as arise from changes in responsibilities of a given governmental unit and which do not exhibit a high degree of variance.

The Northwest Territories' total operating expenditures by major function for the period from 1957-58 to 1972-73 are shown in Table I. The year-to-year percentage change in expenditures on each of these functions is shown in Table II. The eight-fold increase in total operating expenditures between 1967-68 and 1972-73 reflects the increasing responsibilities being assumed by the Government of the Northwest Territories. These changes in responsibilities, together

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[1] Claudia Devita Scott has developed a model for forecasting local (municipal) government expenditures in which personnel expenditures are forecast using estimates of changes in the relevant population, salary, and level of service variables while non-personnel expenditures are forecast by regressing these expenditures on various independent variables over a given historical period (see Forecasting Local Government Spending (Washington: The Urban Institute, 1972)). The highly disaggregative nature of the Scott study, however, suggests that it is best utilized as a budgeting tool.

TABLE I

Government of the Northwest Territories

Operating and Maintenance Expenditures

1957-58 to 1972-73
$ thousands

Year	Education	Public Works	Administration	Local Government	Health	Social Development	Industry & Development	Other	Total O&M Expenditure
1972-73	19,888	16,662	10,327	9,051	7,897	7,452	5,341	9,721	86,339
1971-72	16,115	15,367	9,543	5,434	5,939	5,783	4,221	7,173	69,575
1970-71	13,364	15,564	7,766	4,761	3,892	4,849	3,598	4,504	58,298
1969-70	7,465	7,459	5,205	2,560	3,350	3,159	1,972	3,087	34,257
1968-69	3,078	-	2,503	1,440	2,963	1,427	537[1]	3,724	15,672
1967-68	2,575	313	1,182	399	2,503	1,312	398	1,958	10,640
1966-67	1,867	317	261	207	2,406[2]	975	206[3]	1,747	7,986
1965-66	1,846	160[4]	102	210[5]	2,179	535[6]	120	2,770	7,922
1964-65	1,687	186	191	225	468	501	-	4,692	7,950
1963-64	1,489	97	90	194	524	446	-	4,319	7,159
1962-63	1,391	90	91	190	373	350	-	3,128	5,613
1961-62	986	19	72	164	311	261	-	2,156	3,969
1960-61	-	-	-	-	-	-	-	-	3,334
1959-60	649	17	101	246	365	196	-	935	2,509
1958-59	450	19	67	111	314	155	-	901	2,017
1957-58	316	23	48	149	265	124	-	1,002	1,927

[1] Name changed to economic and community development.

[2] Includes health and hospital service.

[3] Includes co-operative development plus others.

[4] Same as development services.

[5] Same as municipal affairs.

[6] Includes welfare.

Source: Government of the Northwest Territories, Annual Report of Territorial Accounts and Annual Report of the Commissioner.

TABLE II

Government of the Northwest Territories

Operating and Maintenance Expenditures

Percentage Change from Previous Fiscal Year

1958-59 to 1972-73

Percent

Year	Education	Public Works	Adminis-tration	Local Government	Health	Social Development	Industry & Development	Other	Total O&M Expenditure
1972-73	23.4	8.4	8.2	66.6	33.0	28.8	26.5	35.5	24.1
1971-72	20.6	-1.3	22.9	14.1	52.6	19.3	17.3	59.3	19.3
1970-71	79.0	108.7	49.2	86.0	16.2	53.5	82.5	45.9	70.2
1969-70	142.5	-	107.9	77.8	13.1	121.4	267.2	-17.1	118.6
1968-69	19.5	-	111.8	260.9	18.4	8.8	34.9	90.2	47.3
1967-68	37.9	-1.3	352.9	92.8	4.0	34.6	93.2	12.1	33.2
1966-67	1.2	98.0	155.9	-1.3	10.4	82.2	71.3	-36.9	0.8
1965-66	9.4	-13.9	-46.6	-6.6	365.2	6.7	-	-41.0	-0.4
1964-65	13.3	91.2	112.2	15.8	-10.6	12.6	-	8.6	11.0
1963-64	7.0	8.1	-0.7	1.9	40.3	27.3	-	38.1	27.5
1962-63	41.1	363.5	25.6	16.0	20.0	34.2	-	45.1	41.4
1961-62	-	-	-	-	-	-	-	-	19.0
1960-61	-	-	-	-	-	-	-	-	32.9
1959-60	44.3	-14.0	51.5	120.7	16.1	26.4	-	3.8	24.4
1958-59	42.1	-16.4	39.7	-25.3	18.8	25.2	-	-10.1	4.7

Source: Calculated from the data in Table I.

with the wide year-to-year fluctuations which have been observed would appear to negate the use of methods based on the extrapolation of historical trends in order to forecast the appropriate level of expenditures to be taken into account when calculating the deficit grant. As a result, forecasts based on a formula which utilizes data for only the most recent years may be necessary.

There is a body of literature on projecting government expenditures which, in order to overcome some of the problems caused by erratic time series, takes into account individually changes in the three basic components of any expenditure.[2] These three basic components are:

(1) a basic underlying workload component;

(2) a price change component; and

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[2] Some of the seminal conceptual and empirical work carried out in the United States on projecting state and local government expenditures has been carried out by Selma J. Mushkin and Gabrielle C. Lupo (see "Project '70: Projecting the State-Local Sector", Revenue Sharing and Its Alternatives: What Future for Fiscal Federalism?, prepared for the Subcommittee on Fiscal Policy of the Joint Economic Committee, Congress of the United States, Volume III (Washington: U.S. Government Printing Office, 1967), 1367-1393). A refinement of the Mushkin approach may be found in Lawrence R. Kegan and George P. Roniger in "The Outlook for State and Local Finance", Fiscal Issues in the Future of Federalism, Supplementary Paper Number 23, (New York: Committee for Economic Development, 1968).

(3) a residual or quality change component.

In principle, under current budgeting practices, the first two components determine the "A" budget while any quality or level of service changes are included in the "B" budget.

The simplest method of estimating the effect of changes in the basic underlying workload on changes in aggregate expenditures is to assume that the workload varies directly with changes in population. For example, using data for the NWT, the change in workload between 1971-72 and 1973-74 would be calculated as follows:

$$\text{Population Workload Ratio} = \frac{\text{Population (1973)}}{\text{Population (1971)}} = \frac{38,000}{35,000} = 1.086$$

In other words, the population workload for the NWT increased by 8.6 percent during the two-year period considered.

Changes in forecast expenditures due to anticipated price changes may be calculated in the same manner as for changes in population. The relevant ratio in this case is the estimated price index in the program forecast year divided by the price index in the base year. Since no price index exists for expenditures on goods and services by the Northwest Territories' Government, the implicit price deflator for total government current expenditure on goods and services as noted in the National Accounts must be used.[3] On this basis, the change in prices which occurred between 1971-72 and 1973-74 was:

$$\text{Price Ratio} = \frac{\text{Price Index (1973-74)}}{\text{Price Index (1971-72)}} = \frac{196.5}{171.9} = 1.143;$$

that is, prices increased by 14.3 percent.

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[3] The deflation of government current expenditure on goods and services is essentially carried out in two broad segments: wages and salaries and other non-wage expenditure. Wages and salaries in constant dollar terms are prepared by extrapolating the base year average wage or salary on the number of employees actively engaged in producing government goods and services. The series are separately prepared by level of government. Other government current (non-wage) expenditure is divided into non-defence and defence expenditures for deflation by the most appropriate price indices. The various deflated series are summed to obtain the total current dollar value of government current expenditure on goods and services. The aggregate current dollar value is then divided by the aggregate constant dollar value to yield the currently weighted implicit price index.

Historical changes in the scope and quality of the total services provided by the Northwest Territories may be calculated as follows:

(a) Calculate the ratio of total expenditures in the current period to total expenditures in the base period.

(b) Calculate the relevant workload and price ratios which are applicable to total expenditures.

(c) Divide the expenditure ratio by the product of the population workload ratio and the price ratio to yield the scope and quality ratio; for example,

$$\left[\frac{\text{O \& M Exp. (1973-74)}}{\text{O \& M Exp. (1971-72)}}\right] \div \left[\begin{matrix}\text{Workload} \\ \text{Ratio}\end{matrix} \times \begin{matrix}\text{Price} \\ \text{Ratio}\end{matrix}\right] = \left[\begin{matrix}\text{Scope and} \\ \text{Quality Ratio}\end{matrix}\right]$$

$$\text{or} \quad \frac{92{,}203}{67{,}470} \div (1.086 \times 1.143) = 1.102$$

It is clear that any errors or omissions in the calculation of the population workload and price ratios will result in an equivalent but opposite error in the scope and quality ratio.

The historical fluctuations which have taken place in the workload (in this case, population), price, and scope and quality ratios in recent years are shown in Table III. Most of the scope and quality fluctuations in the early years are due to changes in the responsibilities of the Northwest Territories' Government.

Total New Year O&M expenditures for the NWT may be forecast using the following formula (with the Past Year used as a base):

$$\left[\text{Expenditures (PY)}\right] \times \left[\frac{\text{Workload (NY)}}{\text{Workload (PY)}}\right] \times \left[\frac{\text{Price Index (NY)}}{\text{Price Index (PY)}}\right] \times \left[\text{Scope \& Quality Ratio}\right]$$

$$= \left[\text{Forecast Expenditures (NY)}\right]$$

Table III

Northwest Territories

Total O & M Expenditures and

Changes in Expenditures, Population,

Prices, and Scope and Quality

Fiscal Year	Total O & M Expenditure[1]	Changes from Previous Fiscal Year			
		O & M Exp.	Population	Prices	Scope and Quality
	$ Thousands	Percent			
1973-74	92,203	11.1	5.6	6.3	-1.0
1972-73	83,011	23.0	2.9	7.5	11.2
1971-72	67,470	18.4	6.1	6.2	5.1
1970-71	56,985	71.5	6.5	5.3	53.0
1969-70	33,236	121.7	3.3	6.1	102.3
1968-69	14,991	46.8	3.4	7.2	32.5
1967-68	10,213				

residual

[1] Amortization is not included.

At the time the program forecast is prepared in the Spring of the Current Year, actual expenditure data up to and including PY-1 is available. For the Past Year, expenditure data would be preliminary actual, with no actual data being available for the Current Year. Since the formula could be applied to yield a three-year forecast from PY-1 to NY, a two-year forecast from PY to NY, or a one-year forecast from CY to NY, a trade-off must be made between the strength of the base year and the number of years over which a projection must be made.

Forecasts of the future levels of those factors, such as population, which are deemed to constitute the public service workload, together with forecast price increases, are necessary in order to calculate the workload and price ratios, respectively. Then a decision must be made regarding the forecast scope and quality ratios.

If the formula is to be applied to estimate only the New Year A budget expenditures of the NWT, Current Year estimates must be used as a base since no historical A budget series exists.

In this case, the formula becomes

$$\left[\text{Expenditures (CY)}\right] \times \left[\frac{\text{Workload (NY)}}{\text{Workload (CY)}}\right] \times \left[\frac{\text{Price Index (NY)}}{\text{Price Index (CY)}}\right]$$

$$= \left[\text{Forecast Expenditures (NY)}\right]$$

Use of a global formula requires that decisions regarding the following items be made before the formula can become operational:

(1) the base year to be used in the formula;

(2) the method of forecasting:

(a) population changes:

e.g. (i) average of changes that have occurred over a given recent period; or

(ii) a projected change obtained from an independent (that is, non-IAND, -NWT, -TBS) source;

(b) price changes:

e.g. (i) average of changes that have been observed over a given recent period; or

(ii) a projected change obtained from an independent source;

(c) scope and quality changes;

(3) the date on which the formula is to be applied.

Hypothetical Examples

The formula was examined by making some hypothetical calculations for fiscal years 1972-73 and 1973-74. The two hypothetical calculations are shown in Tables IV and V, with data on the original NWT request, the amount included in the Financial Agreement, and actual expenditures shown for comparison. In addition, the amounts which might be yielded in 1974-75 and 1975-76 were this formula adopted by the NWT Government are shown in Tables VI and VII. It must be emphasized that all of the examples are hypothetical in nature and that the population and price ratios used were based on an arbitrary choice of using the previous three-year average. They do not take into account any scope and quality increases, but these changes are footnoted. Were this formula adopted by the NWT, the technique of determining the population and price ratios to be used would be decided upon by the NWT, IAND, and the Program Branch of the TBS.

Table IV

Hypothetical Example of Formula Calculation For 1972-73

Calculation made as of March 1971.

Data Inputs

Population ratio = 1.044 (3-year average)

Price ratio = 1.068 (3-year average)

Base Year Expenditure Estimate (1971-72) = $69,248

Comparison

	$,000
Formula	$77,212
NWT Request	79,563
Financial Agreement	82,869
Actual	83,011

Note: 1) "B" Budget Component of Actual Total = $2.6 million
2) Amortization is not included.
3) Implicit scope and quality change = 7.5%.

Table V

Hypothetical Example of Formula Calculation for 1973-74

Calculation made as of March 1972.

Data Inputs

Population ratio = 1.051 (3-year average)

Price ratio = 1.069 (3-year average)

Base Year Expenditure Estimate (1972-73) = $81,228

Comparison

	$,000
Formula	$91,260
NWT Request	89,882
Financial Agreement	91,548
Actual	92,203

Note: 1) "B" Budget Component of Actual Total = $802,000.
2) Amortization is not included.
3) Implicit scope and quality change = 1.0%.

Table VI

Hypothetical Example of Formula Calculation for 1974-75

Calculation made as of March 1973.

Data Inputs

Population ratio = 1.052 (3-year average)

Price ratio = 1.059 (3-year average)

Base Year Expenditure Estimate (1973-74) = $92,059

Comparison

	$,000
Formula	$102,554
NWT Request	106,113
Financial Agreement	100,700

Note: Amortization is not included.

Table VII

Hypothetical Example of Formula Calculation for 1975-76

Calculation made as of March 1974.

Data Inputs

Population ratio = 1.049 (3-year average)

Price ratio = 1.066 (3-year average)

Base Year Expenditure Estimate (1974-75) = $102,486

Comparison

	$,000
Formula	$114,610
NWT Request	120,307
Financial Agreement	115,162

Note: Amortization is not included.

Conclusions

The purpose of this paper was to outline what formula financing means within the context of determining the level of NWT O&M expenditures to be taken into account when deciding upon the level of the Federal deficit grant.

The global formula discussed in this paper is both comprehensible and flexible, since the method of determining forecast changes in the components included in the formula may be negotiated prior to each annual application. The hypothetical examples of the use of the formula for various years (past, present, and future) suggest that the formula yields reasonable estimates and is, therefore, viable. For these reasons, use of the global formula is worth considering as an alternative to the present A Budget review exercise.

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